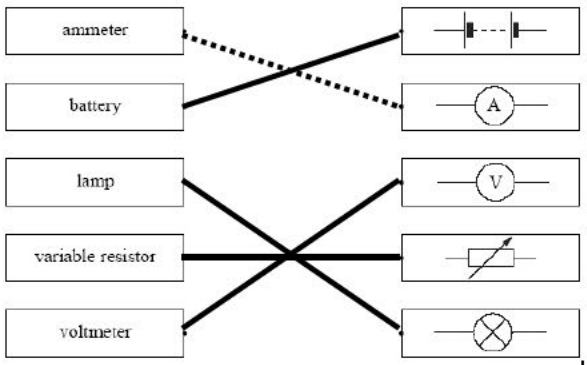
Question number	Answer	Notes	Marks
1 (a)	 all 4 lines;;; any 2 lines;; any one line;	(dotted line is given)	3
(b) (i)	light dependent resistor / LDR;	allow • photo sensitive resistor • light sensitive resistor allow recognisable spellings	1
(ii)	thermistor;	allow recognisable spellings total marks = 5	1

Question number	Answer	Notes	Marks
2	Max of three electrical hazards identified;;; Max of three amplifying details relevant to the hazard(s) identified;;; MP1. Idea of **water** in contact with something electrical e.g. plugs/sockets/switches; MP2. Idea that an electrical device with a heating element reaches a **high temperature**; MP3. Idea that **damaged equipment** poses a hazard; e.g. microwave oven MP4. Idea **overloaded** cables or sockets; MP5. Idea of **trip hazard** from trailing cables;	 Max of 2 amplifications for any one hazard. A repeated amplification can only be credited once e.g. shock, fire, provide plenty of sockets e. Idea that water conducts electricity; Idea that this can cause shock; (risk of) burns; idea that insulation can melt and cause a fire; Live parts should not be exposed; Idea that this can cause shock; leaky microwave radiation can cause cancer; circuits should have correct fuses; can cause a fire; don't use multiway socket extensions; provide sufficient sockets; Do not use extension cables; Provide sufficient sockets; Use short mains leads; NOTE	6

	MP6. Idea of **misusing equipment** e.g. sticking metal objects into a socket or exposed heating element;	Appropriate training/safety regime, e.g. use of 'blanks' to cover sockets that children can reach; Idea that this can cause shock; Use proper (insulated) tools;	

Total 6 marks

Question number	Answer	Notes	Marks
3	Any four of - MP1. either transfer between the two is by conduction; or same SA either way up. MP2. **Infrared** (radiation) mentioned; MP3. Idea of emission of thermal energy; MP4. a correct effect of (surface) colour on emission; MP5. Comparative of surfaces; MP6. correct statement about thermal energy flow at **equilibrium** temperature;	- ignore other comments about conduction, convection , absorption and reflection for thermal energy accept heat or radiation e. black emits heat e. • black is a good emitter • white is a poor emitter e.g. the black loses more heat than the white	4

Total 4 marks

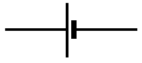
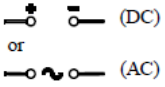
Question number	Answer	Notes	Marks
4 a i	Power = current x voltage;	Accept • rearranged equation • equation in recognised symbols	1
ii	Substitution and rearrangement; Evaluation; eg I = 2000 / 230 8.7 (A)	Accept • 9 (A) • 8.695…..(A) ETC NOT • 8.6 incorrect truncation • 9.0 incorrect rounding	1 1
iii	D 13 A		1
b	Series – single switch to control both; Parallel – independent control;	Allow idea of one element failing (and the other continuing) ignore comments about voltages or currents there is no mark for getting the 2 answers reversed	1

c i	ANY FOUR FROM – MP1. earth connected to (metal) casing; MP2. If casing becomes live/ live wire touches case; MP3. Provides low resistance path (to earth); MP4. (So) large/surge current <u>in earth wire</u>; MP5. (hence) fuse breaks/melts/blows; MP6. (so) circuit switches off or current stops or supply cuts off;	Allow circuit breaker(RCCB) DO NOT CREDIT: the electricity goes to the ground/eq for MP3	4
ii	any two from MP1. It has a metal case; MP2. Metals/the case conducts (electricity); MP3. to prevent (user getting) a shock;		1 1

(Total for question 4 = 12 marks)

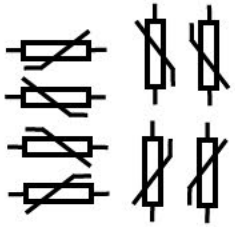
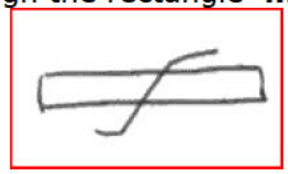
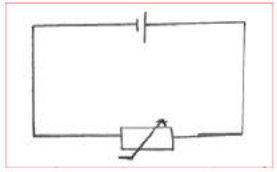
Question number	Answer	Notes	Marks
5 a	Any FOUR from: MP1. Current in <u>coil</u> ; MP2. (Creates) magnetic field (around the wires of the coil); MP3. Interaction of (this) field with that of (permanent) magnets; MP4. There is a force on the wire(of coil); MP5. Reference to left hand rule; MP6. force up on one side and down on other side;	 current in circuit is not enough coil becomes an electromagnet allow field cutting as the interaction idea of catapult field reference to moment/turning effect on the coil	4
b i	one of • Reverse supply polarity (however described); • reverse current direction (however described); • swap magnets over(however described);		1
ii	any one from: • Reduce current (however described); • Reduce voltage (however described); • increase resistance of circuit (however described); • weaker magnetic field (however described);	 Allow : less turns on coil Condone: fewer coils	1

(Total for Question 5= 6 marks)

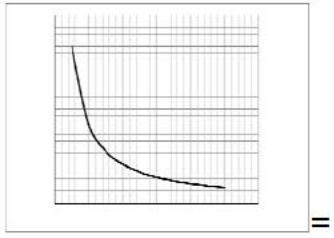
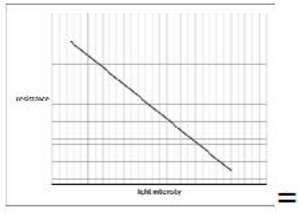
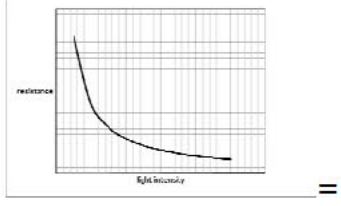
Question number	Answer	Notes	Marks
6 (a) (i)	symbols for circuit components; • cell, battery, 'box' labelled power supply, a.c. symbol, component ends for battery • ammeter or milliammeter • thermistor  a series circuit;	Acceptable power supply symbols    ignore all other symbols	2
(ii)	voltmeter in parallel with thermistor;	ecf from 'thermistor' in ai	1

(iii)	any FIVE from: MP1. measure current at any known/fixed temperature; MP2. measure voltage at any known/fixed temperature; MP3. measure temperature; MP4. vary temp and take new readings ; MP5. idea of allowing temp to equalise between readings; MP6. either change temp by heating water OR start at 100ºC and allow to cool; MP7. either start from ice OR use ice cubes to take temp down below room temp; MP8. calculate V/I; MP9. repetition/averaging (at any stage); MP10. use of stirrer/digital thermometer;		5

Question number	Answer	Notes	Marks
6 (b) (i)	no mark for the choice any valid explanation (dependant on choice of line or curve); e.g. A/curve it fits more points/all the points are closer to the line / eq; OR B /straight line it has 4 points above the line, 4 points below the line/eq;	 accept theory says it should be a curve the resistance will not be zero at 100 ºC	1
(ii)	One of the following ideas:- • the new point could be nearer to one line than the other; • the lines are furthest apart at 10ºC;	 accept this measurement would give more data	1
(c)	Any one correct ; All three correct;; L etal wire at constant temperature K diode J filament lamp		1

Question number	Answer	Notes	Marks
7 (a)	 Symbol can be in any orientation, e.g. 	the line through the rectangle **must** be correct  =0 Ignore the size Ignore the rest of the circuit e.g.  =0 as the line through is incorrect Allow without the connection leads  =1	1
(b) (i)	Voltage = current x resistance;	Allow V = IR Allow rearrangements ignore a bald 'triangle'	1
(ii)	Convert milliamps to amps OR kilo-ohms to ohms; Substitution into *correct* equation & rearrangement; Calculation to greater than 1SF; 2.6 mA = 0.0026 A (R) = $\frac{13.2}{0.0026}$ 7 (Ω)	'show that' question, working must be shown for full mark Allow 5080, 5076 (truncation) 5.080 with working is worth 2 marks 5.08 with no working is worth 1 mark	3

Question number	Answer	Notes	Marks
7 (c)	Any **five** of *ABOUT A* 1. Resistance of A decreases with temperature; 2. For A, {largest slope / rate of change} is at lower temperature ORA {smallest slope /rate of change} is at higher temperature; 3. A is a thermistor (ntc); *ABOUT B* 4. Resistance of B increases with temperature; 5. For B, {largest slope / rate of change} is at higher temperature(s) ORA {smallest slope /rate of change} is at lower temperature; 6. For B, resistance is constant below 50 °C; *ABOUT BOTH* 7. More results for B/ fewer results for A; 8. stated both relationships are non-linear; 9. Range of (temperature/resistance) values for both is similar; 10. data comparison e.g. both have the same resistance at 80 °C;	**Accept** • (MP1) for A, when the temperature is low, the resistance is high, ORA • (MP4) for B, when the temperature is low, the resistance is low, ORA **Allow** component B is a ptc thermistor ORA Up to 60 °C **Ignore:** inversely proportional positive/negative correlation Do **not** take implication of MP8 when MP 1,2,4,5 is given	5
		Total	**10**

Question number	Answer	Notes	Marks
8	Bright light low resistance/Dim light high resistance; Idea of an inverse relationship between R and intensity; e.g. 'bright at lower resistance' ORA =2 marks Idea of non-linear relationship;	ACCEPT Correct answers shown on a labelled sketch graph (light / intensity / light intensity acceptable for one axis, resistance for the other)  = 0 (axis/axes not labelled)  = 2 (first two marking points)  = 3 marks If diagram and text contradict, use list principle REJECT Negative values of resistance or light intensity in sketch graph for 1 mark	3

Total 3 Marks

Question number	Answer	Notes	Marks
9 (a)	Any two of braking force; air resistance / drag; (road or tyre) friction;	 ACCEPT Headwind/wind resistance in this case	2
(b) (i)	force = mass x acceleration;	ACCEPT mass = force ÷ acceleration ACCEPT acceleration = force ÷ mass ACCEPT standard symbols, F = m x a	1
(ii)	Substitution in correct equation; Calculation; e.g. 1400 x 5.5 = 7700 (N) or 7.7 k(N)	correct answer = 2 marks	2
(c)	Attempt at area under the graph (e.g. ½ x base x height); ½ x 4 x 22; Correct answer 44 (m); OR distance = (average) speed x time; 11 x 4; correct answer 44 (m)	correct answer = 3 marks first mark implied in correct substitution first mark implied in correct substitution	3
(d) (i)	(graph is a) curve(d line) /gradient changes / slope changes / (graph is) not a straight line / graph levels off;		1
(ii)	Any two of <u>Increase</u> in air resistance / drag / wind resistance; <u>Increase</u> in road resistance / (tyre) friction; <u>Decrease</u> in resultant force; Road becomes <u>steeper</u> / goes uphill;	IGNORE references to terminal velocity IGNORE 'more weight in the car' IGNORE 'driver changed gear' IGNORE 'driver turned corner'	2

Total 11 Marks

Question number	Answer	Notes	Marks
10 (a)	A carbon;		(1)
(b)	A negatively charged electrons;		(1)
(c)	D steel;		(1)
(d)	C 2 N poles facing;		(1)

Total for Question 10 = 4 marks